About Population Estimate Accuracy

General Discussion

Population estimates are approximations. They are not assumed to have precision accuracy. Population estimates are generally developed by relating symptomatic data to population—or population change—and then tracking population change on the basis of change in the indicator data. *The distinguishing feature about population estimates is that they are based on actual data. Estimates never extend beyond the present.* While some estimate procedures contain assumptions and extensions of prior data and/or trends, they are developed from actual indicator data. For example, The Housing Unit Population Estimate Method uses actual construction and demolition records to update the housing stock in a specific area. Population is developed by applying occupancy rates and average person per household values to the estimate of current housing. Occupancy rates and household size, usually obtained from the last decennial census are sometimes updated on the basis of current surveys or regression models.

The Office of Financial Management's (OFM) population estimates are developed as accurately as possible from standard and tested methods. The specific estimation procedures used depends on the availability of state and local data. The availability of data depends on how soon the figures are needed, and whether the estimates are for the state, counties, cities, or non-political boundaries.

Data are extremely limited for cities or any special areas. City data are often of questionable accuracy due to boundary changes. If timely estimates are needed, less data are available because of lengthy collection intervals. *All of the administrative and census input data used for the OFM estimates are always reviewed for consistency*.

OFM develops two basic types of estimates. These are described below.

1. *Post-censal estimates approximate the population size and/or population characteristics of specifically defined areas after each decennial census, but before the next census*. As noted above, population estimates are generally developed by relating symptomatic data to population—or population change—and then approximating the current population by the change in the indicator data. To the extent the input data are good, and the prior relationships and are stable, the resulting population estimates should be reasonably accurate. However, if the quality or comparability of the input data change, and/or the relationship between population and the indicator data change, then accuracy of the resulting population estimates will deteriorate. For example, post-censal population estimates for Washington's rural-retirement-recreational counties were found to have overestimated growth when the Census 2000 counts were released. Over the decade, population

increases were slowing in relation to housing growth due to declines in household size.

OFM's post-censal estimate methodologies are reviewed and evaluated for accuracy and updated after each decennial census. Mid-decade corrections may be made on the basis of supplemental data.

2. *Inter-censal estimates approximate population size and/or the population characteristics of areas for specific intervals between two decennial census counts*. Inter-censal estimates are more accurate than post-censal estimates because the annual approximations are bracketed on both sides by actual census counts. The pattern of change across the decade may be linked to symptomatic data. For example, annual inter-censal housing unit estimates for counties would typically use the actual decade change in housing and distribute change across the decade in accord with the building and demolition data. Decade change in occupancy and average household size could be interpolated across the decade, or estimated with supplemental data. There is no solid accuracy check for inter-censal data.

Evaluation of Accuracy

Determining the accuracy of population estimates requires an accurate measuring stick. However, in the demographic environment, there is no 100 percent accurate measuring stick. Accuracy is a continuum. Estimates, as approximations, are compared to more reliable, but less than perfect population counts. Washington has always had relatively accurate federal census enumerations. However, even minor inaccuracies or inconsistencies in federal census enumerations often cast an unfair shadow on estimates. Measurement discrepancies occur for various reasons and have differential impacts. A few noteworthy areas of concern are provided below.

1. Changes in decennial census coverage. Measurement is difficult in Census 2000 due to improved coverage (counts) compared to 1990. National paid media advertising improved the 2000 census counts compared to 1990. Approximately 50,000 of the state's 5,894,121 count for 2000 were people present in 1990, but missed in the 1990 census. Thus, by using the 1990 count as a starting point, the estimate methodology was missing 50,000. Variance in the resulting state estimate for 2000 improves from -1.5 percent to -0.7 percent when the estimate is adjusted for the change in coverage. This is discussed further in the following sections.

   Change in coverage also has a geographic impact. Since differential undercounting occurs for most racial groupings, areas with large percentages of Hispanics and Indians will generally have more variance when compared to the census 2000 counts.

2. Changes in definitions and shifts self-definition. Changes in race definitions for Census 2000 makes evaluation of the race estimation methodologies more difficult, especially when combined with improved coverage. Race and ethnic enumerations are always somewhat of an "evaluation problem" due to self-identification. Shifts in the awareness and importance of one's ancestry between each decennial census results in a lack of comparability in the counts that is needed for valid comparisons.

3. Boundary differences. State and county boundaries are relatively stable. However, city boundaries may be subject to considerable change from enumeration to enumeration. Evaluation of the Bureau's listing of municipal boundary changes between 1990 and 2000, just prior to the decennial census, indicated 228 discrepancies in the Bureau records compared to OFM. Problems include the Bureau missing annexations recorded by the state, the Bureau including annexations that had been rejected by the state, and the Bureau inaccurately recording the effective date of annexations before or after the 2000 count date. Approximately one-quarter of the boundary discrepancies ever get resolved.

4. January 1 versus April 1 city boundaries. The Bureau determines the current boundary of each city on January 1 of the decennial census year—and then uses the January 1 boundary when the population is counted on April 1. OFM prepares population estimates according to each city's boundary on April 1, and also estimates the population as of April 1. Thus, any comparison of estimates and census counts needs to account for the city boundary difference. *Between January and April in 2000, nine cities in Washington annexed 3,347 people that would have been included in their OFM population estimate, but not in the decennial census count. This provides an example of the magnitude of the population differences that may occur when the OFM estimates and Bureau's counts use different boundaries. In this case, it is just nine cities with boundary changes over a three-month period*. All of the evaluations done by OFM move the Bureau city boundaries to April 1 and add the annexed populations. As previously noted, only a few of the boundary discrepancies that accumulated over the decade are ever corrected.

Estimate Comparisons to Census Counts

This section provides a comparison between the OFM population estimates and the federal census counts. A comparison is made for the Bureau of the Census estimates too, but not all the information is currently available. The Bureau of the Census information will be added when available. The summary measure used to evaluate the accuracy of the population estimates is the *average absolute percent difference*. This is the average percent variance of the estimates compared to the census counts, regardless of the "positive" or "negative" difference.

State and County Estimate Comparisons to Census counts and Coverage Considerations

In 1990, OFM's state estimate was -1.4 percent off the federal census count. In the year 2000, the difference was -1.5 percent. The state's estimate was actually more accurate in 2000 than in 1990. Several method improvements had been implemented over the decade. However, the federal census count was so improved in 2000, due to national medial advertising and other factors, about 50,000 persons missed in the 1990 count were "picked up" in the 2000 count. *Coverage, or the proportion of person counted in the census, is usually not an issue because each decennial census count misses about the same proportion of people. Only when a count is notably better or worse than the "comparison year" does it become an issue in gauging the accuracy of estimation methods.*

Table 1: Comparison of Office of Financial Management and Bureau of the Census Population Estimates for Counties with the 1990 and 2000 Census

	Office of Financial Management For State/39 Counties		Bureau of the Census State & County Estimates Across the US	
	1990 Average Absolute % Difference	2000 Average Absolute % Difference	1990 Average Absolute % Difference	2000 Average Absolute % Difference
State Level (1 case)	1.4	1.5 (Adj.)0.7	(About)2.5	*Not Yet Available*
Counties (39 Cases)	1.9	2.4	(About)4.2	

Census 2000 does present a problem. If an adjustment is made for the improved 2000 coverage, the variance in the OFM state estimate compared to the census count drops to -0.7 percent (Table 1).

The same coverage problem exists when examining county estimate accuracy for 2000. Average absolute difference between the census and estimate in 1990 was 1.9 percent and 2.4 percent for census 2000. Individual county variances for 2000 show the impact of improved counting in 2000. Most of the counties with the largest percent variance in 2000 have large Indian and Hispanic populations. These include Franklin (-7.0), Chelan (-6.2), Pend Oreille (-4.5), Grant (-4.3), Stevens (-3.9), Yakima (-3.9), and Adams (-3.8) Counties. Minorities have been one of the most undercounted groups in each decennial census. Coverage in the 2000 census, in terms of the percent of population enumerated improved from 88 percent for Indians in 1990 to 93 percent in 2000. For Hispanics, the coverage improved from 95 percent in 1990 to 97 percent in 2000.

Table 2: Comparison of Office of Financial Management County Population Estimates with Census Counts

	1990 Census	1990 Estimates	Difference	Percent Difference	2000 Census	2000 Estimates	Difference	Percent Difference
State	4,866,692	4,798,100	-68,592	-1.41	5,894,121	5,803,400	-90,721	-1.54
Adams	13,603	13,600	-3	-0.02	16,428	15,800	-628	-3.82
Asotin	17,605	17,700	95	0.54	20,551	20,000	-551	-2.68
Benton	112,560	110,000	-2,560	-2.27	142,475	140,700	-1,775	-1.25
Chelan	52,250	50,100	-2,150	-4.11	66,616	62,600	-4,016	-6.03
Clallam	56,464	57,000	536	0.95	64,179	66,700	2,521	3.93
Clark	238,053	228,700	-9,353	-3.93	345,238	345,000	-238	-0.07
Columbia	4,024	4,000	-24	-0.60	4,064	4,100	36	0.89
Cowlitz	82,119	83,500	1,381	1.68	92,948	94,900	1,952	2.10
Douglas	26,205	26,500	295	1.13	32,603	32,200	-403	-1.24
Ferry	6,295	6,400	105	1.67	7,260	7,300	40	0.55
Franklin	37,473	34,600	-2,873	-7.67	49,347	45,900	-3,447	-6.99
Garfield	2,248	2,300	52	2.31	2,397	2,300	-97	-4.05
Grant	54,758	53,100	-1,658	-3.03	74,698	71,500	-3,198	-4.28
GHarbor	64,175	64,200	25	0.04	67,194	67,100	-94	-0.14
Island	60,195	59,200	-995	-1.65	71,558	74,200	2,642	3.69
Jefferson	20,146	20,000	-146	-0.72	26,299	26,800	501	1.91
King	1,507,319	1,482,800	-24,519	-1.63	1,737,034	1,685,600	-51,434	-2.96
Kitsap	189,731	188,800	-931	-0.49	231,969	230,200	-1,769	-0.76
Kittitas	26,725	25,800	-925	-3.46	33,362	32,500	-862	-2.58
Klickitat	16,616	16,800	184	1.11	19,161	19,600	439	2.29
Lewis	59,358	59,200	-158	-0.27	68,600	69,000	400	0.58
Lincoln	8,864	8,800	-64	-0.72	10,184	10,000	-184	-1.81
Mason	38,341	38,300	-41	-0.11	49,405	49,300	-105	-0.21
Okanogan	33,350	32,100	-1,250	-3.75	39,564	38,500	-1,064	-2.69
Pacific	18,882	18,100	-782	-4.14	20,984	21,300	316	1.51
Pend Oreille	8,915	9,000	85	0.95	11,732	11,200	-532	-4.53
Pierce	586,203	574,500	-11,703	-2.00	700,820	706,000	5,180	0.74
San Juan	10,035	10,100	65	0.65	14,077	12,700	-1,377	-9.78
Skagit	79,555	76,100	-3,455	-4.34	102,979	102,300	-679	-0.66
Skamania	8,289	8,100	-189	-2.28	9,872	9,900	28	0.28
Snohomish	465,642	450,200	-15,442	-3.32	606,024	593,500	-12,524	-2.07
Spokane	361,364	367,200	5,836	1.61	417,939	415,000	-2,939	-0.70
Stevens	30,948	30,600	-348	-1.12	40,066	38,500	-1,566	-3.91
Thurston	161,238	161,800	562	0.35	207,355	204,300	-3,055	-1.47
Wahkaikum	3,327	3,500	173	5.20	3,824	3,900	76	1.99
Walla Walla	48,439	49,100	661	1.36	55,180	54,200	-980	-1.78
Whatcom	127,780	126,400	-1,380	-1.08	166,814	163,500	-3,314	-1.99
Whitman	38,775	38,300	-475	-1.23	40,740	41,300	560	1.37
Yakima	188,823	191,600	2,777	1.47	222,581	214,000	-8,581	-3.86

City Estimate Comparisons to Census Counts

Tables 3 and 4 show city and town population estimates compared to decennial census counts. City variances are shown by size of cities in groupings because small cities tend to have large percent variances. The average absolute percent variance for OFM's estimates was 6.1 percent in 1990 and 7.2 percent in 2000.

Table 3: Comparison of Office of Financial Management and Bureau of the Census Population Estimates for Incorporated Places with 1990 Census Counts

Population Size Categories	OFM Housing Unit City/Town Estimates		Bureau of the Census Administrative Records Target Place Estimates	
	Number of Cities	Average Absolute % Difference	Number of Cities	Average Absolute % Difference
0-99	3	10.22	1,016	47.2
100-249	18	9.32	2,423	25.5
250-499	25	6.88	2,947	19.8
500-999	43	5.39	3,223	16.7
1,000-2,499	54	5.44	3,659	13.3
2,500-4,999	38	7.15	2,030	10.9
5,000-9,999	27	4.69	1,553	8.5
10,000-24,999	22	6.16	1,269	7.2
25,000-49,999	14	4.19	560	6.2
50,000-99,999	5	5.22	304	5.5
100,000 and Over	3	3.7	172	4.6
Total	252	6.05	19,156	16.8

Note: OFM Estimates compared to federal census counts that are adjusted to include annexation through April 1, 2000. Cities conducting a special census in April 1, 2000 are excluded from the comparison.

Table 4: Comparison of Office of Financial Management and Bureau of the Census Population Estimates for Incorporated Places with 2000 Census Counts

Population Size Categories	OFM Housing Unit City/Town Estimates		Bureau of the Census Housing Unit Estimate Place Estimates	
	Number of Cities	Average Absolute % Difference	Number of Cities	Average Absolute % Difference
0-99	1	17.3	*Not yet available*	*Not yet available*
100-249	15	13.97		
250-499	27	10.76		
500-999	35	8.60		
1,000-2,499	54	6.61		
2,500-4,999	35	6.31		
5,000-9,999	38	5.57		
10,000-24,999	26	5.29		
25,000-49,999	22	5.98		
50,000-99,999	9	5.34		
100,000 and Over	5	3.58		
Total	267	7.22		

Note: OFM Estimates compared to federal census counts that are adjusted to include annexation through April 1, 2000. Cities conducting a special census in April 1, 2000 are excluded from the comparison.

Improved coverage in Census 2000 also has an affect on the evaluation of city estimates. Overall, some of the increased variance in the city figures may also be due to the large number of new municipal incorporations over the 1990s decade. It has proved to be extremely difficult to develop accurate changes in housing for new incorporation when the building permits need to be sorted from county permit files based on address.

Other Evaluations

Other evaluations for race estimates and age estimates will be added to this site as they are made. For a more complete description of city and county estimation methods see Population Process and Methods at this sub-location.